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ANTICIPATIONS

ANTICIPATIONS

OF THE
REACTION OF MECHANICAL AND SCIENTIFIC
PROGRESS UPON HUMAN LIFE
AND THOUGHT

BY

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AUTHOR OF

"LOVE AND MR. LEWISHAM," "THE ISLAND OF DR. MOREAU,"
AND "TALES OF SPACE AND TIME."

NEW AND CHEAPER EDITION
WITH AUTHOR'S SPECIALLY-WRITTEN INTRODUCTION

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AN INTRODUCTION TO THE 1914 EDITION

IT is now nearly fifteen years since *Anticipations* was written, and it is with a certain detachment and curiosity that I have read it over again to consider very seriously whether the issue of a fresh edition is justifiable. I have looked at the book only very occasionally since its first publication, I have never read it through since I passed the proofs for press until the present occasion, and on the whole I am surprised to find how little there is in it that I would change were I to rewrite it at the present time. It is a better book than I have been in the habit of thinking it was, and whatever the value of both of them to the world at large may be, the H. G. Wells of thirty-three has little to be ashamed of in presenting his book to the criticisms of the H. G. Wells of forty-eight. There are places, as I will presently indicate, which the latter, with some advantages of travel and experience, may be inclined to consider a little thin; there are ignorances and there are several rash and harsh generalizations; but an occasional trick of

harshness and moments of leaping ignorance are in the blood of H. G. Wells; everybody who reads him has to stand that—he has to stand it himself more than any one—and forty-eight has, I fear, but little reason on that score for a superior attitude to thirty-three. It is like a lisp or an ugly voice. On the whole, and that is the astonishing thing, the book stands; there are places when you might very well think the writer was writing about the present instead of lunging boldly into what was then the future; and it may even be that in checking its forecasts by accomplishment, the reader will find an interest that his predecessor at the beginning of the century necessarily lacked.

Remember that the book was written during the Boer War, and before the complete publication of the 1901 census returns. Since then not only these but the returns of 1911 have come to hand to confirm very thoroughly the anticipations of urban extension, of social segregation and of the altering weight of classes that constitutes the opening chapters. All that has worked out very satisfactorily, so that even quite detailed prophecies have been confirmed, such as the disappearance of literary "Boomsters" (p. 139), and the rot of the press and the appearance of smaller newspapers (compare the *Standard* and the *Daily Herald* with the considerations on page 163). And further on a considerable claim for verification may be based upon the estimate of Russia's

power, made five years before the revolt of Moscow and the war with Japan. The whole of that chapter, the Larger Synthesis, has stood the wear of fourteen years remarkably well. For the most part it might have been written yesterday. But on the other hand, there are undeniable failures. Those specialized roads for motors, for example, and particularly the one that was to run from London to Brighton, do not materialize, and the book displays a remarkable want of confidence in the immediate practicability of either flying machines or submarines. Almost everyone who reads this book now will laugh at my timid little bladder-assisted aeroplanes, and yet, in 1901, I was considered a very extravagant young man. "Long before 2000, and very probably before 1950, a successful aeroplane" — the boldness of it! The very stalest part of *Anticipations* are the anticipations of aerial war. But the laugh in that matter is more against me than the uninformed would believe, for even as I wrote these hesitating words, there lay in the bureau at which I wrote a pile of notes upon aviation, which a certain young soldier had confided to my keeping before he went to South Africa. He had come to me because I, at any rate, did not "think the whole blessed thing idiotic." If he came back I was to return them to him, it was his secret and he would go on with it; if he was killed I was to get them published. And now the Dunne self-balancing aeroplane defies the gales, and the other day, by Captain Dunne's kindness,

I was soaring three thousand feet over the town of Sheerness.

The stuff about the "New Republic," and the attempt to define the social classes of the new age, is, I think, the most permanently valuable part of this book. The general idea of the "New Republic," the onslaught on "Democracy," the manifest dislike for such partizan and particularist things as trade unionism and nationalism are as much a part of me as the intonations of my voice or the shape of my nose. That conception of an open conspiracy of intellectuals and wilful people against existing institutions and existing limitations and boundaries is always with me; it is my King Charles's head, and it forms the substance of the longest novel I have ever written—that is, if ever the war will let me get it written—the novel I am still writing. I admit that after fourteen years this open conspiracy still does not very definitely realize itself, but in that matter I have a constitutional undying patience. That open conspiracy will come. It is my faith. It is my form of political thought.

Since *Anticipations* was written I have been through the Fabian Society, and it is amusing in this moment of retrospect to recall that plunge and that tumultuous emergence. In the days when I wrote *Anticipations* I knew scarcely more of the Fabian Society than I did of the Zetetic Society, but the publication of that book and its follower *Mankind*

in the Making, brought Mr. and Mrs. Sidney Webb into my world. They appeared riding very rapidly upon bicycles, from the direction of London, offering certain criticisms of my general forecast and urging me to join and stimulate the Fabians. This extraordinary couple, so able and energetic, so devoted, so perplexingly limited, exercised me enormously. Their essential criticism of *Anticipations* was that I did not sufficiently recognize the need and probability of a specialized governing class, and they expounded to my instinctively shrinking intelligence that conception of a great bureaucracy which it has been their life-work to convey to the English intelligence. They tried to bring my *New Republic* within the official dimensions of their bureaucratic state while I as earnestly tried to relax their outlook to the demands of my own temperament. *A Modern Utopia* with its Samurai was the fruit of this transitory and never entirely harmonious marriage of minds, and then, recoiling as it were, I set myself with what I now perceive was an entirely exaggerated and unnecessary horror to release the Fabian Society and British Socialism from their influence. I failed scandalously after preposterous wranglings at Clifford's Inn and Essex Hall, wranglings in which Mr. Bernard Shaw somehow contrived to take a leading and entirely incomprehensible part, and which I still find too amusing to regret, and when I did at last draw breath on the further side of these discussions it

was with Mr. and Mrs. Sidney Webb beyond the reach of any ordinary apology, and a much clearer, if perhaps not materially different, conception of the underlying forces of government than those set forth in this book.

I saw then what hitherto I had merely felt that there was in the affairs of mankind something unorganized which is greater than any organization. This unorganized power is the ultimate sovereign in the world. It is a thing of the intellectual life and it is also a thing of the will. It is something transcending persons just as physical or biological science or mathematics transcends persons. It is a racial purpose to which our reason in the measure of its strength, submits us. It is what was intended when people used to talk about an Age of Reason, it was vaguely apprehended when the Victorians spoke of Public Opinion. Since writing *Anticipations* I have got into the habit of using for it the not very elegant phrase, the Collective Mind. I hope someone will soon find a better expression. This Collective Mind is essentially an extension of the spirit of science to all human affairs, its method is to seek and speak and serve the truth and to subordinate oneself to one's conception of a general purpose. Its immediate social and political effect is an insistent demand for perfect freedom of thought and discussion. Social and political order it values only as a means of freedom. But in these earlier books and until I had come

into contact with those dreams of official controls, "governing classes" and the like, in action, it is manifest how little I apprehended the danger of interference and paralysis which through the self-sufficiency of governing and managing persons any attempt to organize this collective mind involves. That chiefly is what I should alter if I were to rewrite *Anticipations* now. I should point out that the New Republic is not a type and a class of persons but *a power in men's minds and in mankind*. And that the worst enemies the Collective Mind can have, are a swarm of busy little bureaucrats professing to direct or protect it, gaining a kind of stifling control of it and working in its name. Order is a convenience, but Anarchism is the aim and outcome of that convenience. For the material securities of life indeed we want police and roads and maps and market rules, "efficiency" and government, but for the supreme things we have to abandon the methods of self-preservation and get out of cliques, Academies, securities and all associations. It is not by canvassing and committees, by tricks and violence, but by the sheer power of naked reasonableness, by propaganda and open intention, by feats and devotions of the intelligence, that the great state of the future, the world state, will come into being.

H. G. WELLS.

ANTICIPATIONS

I

LOCOMOTION IN THE TWENTIETH CENTURY

IT is proposed in this book to present in as orderly an arrangement as the necessarily diffused nature of the subject admits, certain speculations about the trend of present forces, speculations which, taken all together, will build up an imperfect and very hypothetical, but sincerely intended forecast of the way things will probably go in this new century.¹ Necessarily diffidence will be one of the graces of the performance. Hitherto such forecasts have been presented almost invariably in the form of fiction, and commonly the provocation of the satirical opportunity has been too much for the writer;²

¹ In the earlier papers, of which this is the first, attention will be given to the probable development of the civilized community in general. Afterwards these generalizations will be modified in accordance with certain broad differences of race, custom, and religion.

² Of quite serious forecasts and inductions of things to come, the number is very small indeed; a suggestion or so of Mr. Herbert Spencer's, Mr. Kidd's *Social Evolution*, some hints from Mr. Archdall Reid, some political forecasts, German for the most part (Hartmann's

the narrative form becomes more and more of a nuisance as the speculative inductions become sincerer, and here it will be abandoned altogether in favour of a texture of frank inquiries and arranged considerations. Our utmost aim is a rough sketch of the coming time, a prospectus, as it were, of the joint undertaking of mankind in facing these *impending years. The reader is a prospective shareholder—he and his heirs—though whether he will find this anticipatory balance-sheet to his belief or liking is another matter.

For reasons that will develop themselves more clearly as these papers unfold, it is extremely convenient to begin with a speculation upon the probable developments and changes of the means of land

Earth in the Twentieth Century, e.g.), some incidental forecasts by Professor Langley (*Century Magazine*, December, 1884, e.g.), and such isolated computations as Professor Crookes' wheat warning, and the various estimates of our coal supply, make almost a complete bibliography. Of fiction, of course, there is abundance: *Stories of the Year 2000*, and *Battles of Dorking*, and the like—I learn from Mr. Peddie, the bibliographer, over one hundred pamphlets and books of that description. But from its very nature, and I am writing with the intimacy of one who has tried, fiction can never be satisfactory in this application. Fiction is necessarily concrete and definite; it permits of no open alternatives; its aim of illusion prevents a proper amplitude of demonstration, and modern prophecy should be, one submits, a branch of speculation, and should follow with all decorum the scientific method. The very form of fiction carries with it something of disavowal; indeed, very much of the Fiction of the Future pretty frankly abandons the prophetic altogether, and becomes polemical, cautionary, or idealistic, and a mere footnote and commentary to our present discontents.

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locomotion during the coming decades. No one who has studied the civil history of the nineteenth century will deny how far-reaching the consequences of changes in transit may be, and no one who has studied the military performances of General Buller and General De Wet but will see that upon transport, upon locomotion, may also hang the most momentous issues of politics and war. The growth of our great cities, the rapid populating of America, the entry of China into the field of European politics are, for example, quite obviously and directly consequences of new methods of locomotion. And while so much hangs upon the development of these methods, that development is, on the other hand, a process comparatively independent, now at any rate, of most of the other great movements affected by it. It depends upon a sequence of ideas arising, and of experiments made, and upon laws of political economy, almost as inevitable as natural laws. Such great issues, supposing them to be possible, as the return of Western Europe to the Roman communion, the overthrow of the British Empire by Germany, or the inundation of Europe by the "Yellow Peril," might conceivably affect such details, let us say, as door-handles and ventilators or mileage of line, but would probably leave the essential features of the evolution of locomotion untouched. The evolution of locomotion has a purely historical relation to the Western European peoples. It is no longer

dependent upon them, or exclusively in their hands. The Malay nowadays sets out upon his pilgrimage to Mecca in an excursion steamship of iron, and the immemorial Hindoo goes a-shopping in a train, and in Japan and Australasia and America, there are plentiful hands and minds to take up the process now, even should the European let it fall.

The beginning of this twentieth century happens to coincide with a very interesting phase in that great development of means of land transit that has been the distinctive feature (speaking materially) of the nineteenth century. The nineteenth century, when it takes its place with the other centuries in the chronological charts of the future, will, if it needs a symbol, almost inevitably have as that symbol a steam engine running upon a railway. This period covers the first experiments, the first great developments, and the complete elaboration of that mode of transit, and the determination of nearly all the broad features of this century's history may be traced directly or indirectly to that process. And since an interesting light is thrown upon the new phases in land locomotion that are now beginning, it will be well to begin this forecast with a retrospect, and to revise very shortly the history of the addition of steam travel to the resources of mankind.

A curious and profitable question arises at once. How is it that the steam locomotive appeared at the time it did, and not earlier in the history of the world?

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Because it was not invented. But why was it not invented? Not for want of a crowning intellect, for none of the many minds concerned in the development strikes one—as the mind of Newton, Shakespeare, or Darwin strikes one—as being that of an unprecedented man. It is not that the need for the railway and steam engine had only just arisen, and—to use one of the most egregiously wrong and misleading phrases that ever dropped from the lips of man—the demand created the supply; it was quite the other way about. There was really no urgent demand for such things at the time; the current needs of the European world seem to have been fairly well served by coach and diligence in 1800, and, on the other hand, every administrator of intelligence in the Roman and Chinese empires must have felt an urgent need for more rapid methods of transit than those at his disposal. Nor was the development of the steam locomotive the result of any sudden discovery of steam. Steam, and something of the mechanical possibilities of steam, had been known for two thousand years; it had been used for pumping water, opening doors, and working toys, before the Christian era. It may be urged that this advance was the outcome of that new and more systematic handling of knowledge initiated by Lord Bacon and sustained by the Royal Society; but this does not appear to have been the case, though no doubt the new habits of mind that spread outward from that

centre played their part. The men whose names are cardinal in the history of this development invented, for the most part, in a quite empirical way, and Trevithick's engine was running along its rails and Evan's boat was walloping up the Hudson a quarter of a century before Carnot expounded his general proposition. There were no such deductions from principles to application as occur in the story of electricity to justify our attribution of the steam engine to the scientific impulse. Nor does this particular invention seem to have been directly due to the new possibilities of reducing, shaping, and casting iron, afforded by the substitution of coal for wood in iron works; through the greater temperature afforded by a coal fire. In China coal has been used in the reduction of iron for many centuries. No doubt these new facilities did greatly help the steam engine in its invasion of the field of common life, but quite certainly they were not sufficient to set it going. It was, indeed, not one cause, but a very complex and unprecedented series of causes, that set the steam locomotive going. It was indirectly, and in another way, that the introduction of coal became the decisive factor. One peculiar condition of its production in England seems to have supplied just one ingredient that had been missing for two thousand years in the group of conditions that were necessary before the steam locomotive could appear.

This missing ingredient was a demand for some

comparatively simple, profitable machine, upon which the elementary principles of steam utilization could be worked out. If one studies Stephenson's "Rocket" in detail, as one realizes its profound complexity, one begins to understand how impossible it would have been for that structure to have come into existence *de novo*, however urgently the world had need of it. But it happened that the coal needed to replace the dwindling forests of this small and exceptionally rain-saturated country occurs in low hollow basins overlying clay, and not, as in China and the Alleghanies for example, on high-lying outcrops, that can be worked as chalk is worked in England. From this fact it followed that some quite unprecedented pumping appliances became necessary, and the thoughts of practical men were turned thereby to the long-neglected possibilities of steam. Wind was extremely inconvenient for the purpose of pumping, because in these latitudes it is inconstant: it was costly, too, because at any time the labourers might be obliged to sit at the pit's mouth for weeks together, whistling for a gale or waiting for the water to be got under again. But steam had already been used for pumping upon one or two estates in England—rather as a toy than in earnest—before the middle of the seventeenth century, and the attempt to employ it was so obvious as to be practically unavoidable.¹ The water

¹ It might have been used in the same way in Italy in the first century, had not the grandiose taste for aqueducts prevailed.

trickling into the coal measures¹ acted, therefore, like water trickling upon chemicals that have long been mixed together dry and inert. Immediately the latent reactions were set going. Savery, Newcomen, a host of other workers, culminating in Watt, working always by steps that were at least so nearly obvious as to give rise again and again to simultaneous discoveries, changed this toy of steam into a real, a commercial thing, developed a trade in pumping engines, created foundries and a new art of engineering, and almost unconscious of what they were doing, made the steam locomotive a well-nigh unavoidable consequence. At last, after a century of improvement on pumping engines, there remained nothing but the very obvious stage of getting the engine that had been developed on wheels and out upon the ways of the world.

Ever and again during the eighteenth century an engine would be put upon the roads and pronounced a failure—one monstrous Palæoferric creature was visible on a French high road as early as 1769—but by the dawn of the nineteenth century the problem had very nearly got itself solved. By 1804 Trevithick had a steam locomotive indisputably in motion and almost financially possible, and from his hands it puffed its way, slowly at first, and then, under Stephenson, faster and faster, to a transitory empire over the earth. It was a steam locomotive—but for

¹ And also into the Cornwall mines, be it noted.

all that it was primarily a *steam engine for pumping* adapted to a new end; it was a steam engine whose ancestral stage had developed under conditions that were by no means exacting in the matter of weight. And from that fact followed a consequence that has hampered railway travel and transport very greatly, and that is tolerated nowadays only through a belief in its practical necessity. The steam locomotive was all too huge and heavy for the high road—it had to be put upon rails. And so clearly linked are steam engines and railways in our minds that, in common language now, the latter implies the former. But indeed it is the result of accidental impediments, of avoidable difficulties that we travel to-day on rails.

Railway travelling is at best a compromise. The quite conceivable ideal of locomotive convenience, so far as travellers are concerned, is surely a highly mobile conveyance capable of travelling easily and swiftly to any desired point, traversing, at a reasonably controlled pace, the ordinary roads and streets, and having access for higher rates of speed and long-distance travelling to specialized ways restricted to swift traffic, and possibly furnished with guide-rails. For the collection and delivery of all sorts of perishable goods also the same system is obviously altogether superior to the existing methods. Moreover, such a system would admit of that secular progress in engines and vehicles that the stereotyped conditions of the railway have almost completely

arrested, because it would allow almost any new pattern to be put at once upon the ways without interference with the established traffic. Had such an ideal been kept in view from the first the traveller would now be able to get through his long-distance journeys at a pace of from seventy miles or more an hour without changing, and without any of the trouble, waiting, expense, and delay that arises between the household or hotel and the actual rail. It was an ideal that must have been at least possible to an intelligent person fifty years ago, and, had it been resolutely pursued, the world, instead of fumbling from compromise to compromise as it always has done and as it will do very probably for many centuries yet, might have been provided to-day, not only with an infinitely more practicable method of communication, but with one capable of a steady and continual evolution from year to year.

But there was a more obvious path of development and one immediately cheaper, and along that path went short-sighted Nineteenth Century Progress, quite heedless of the possibility of ending in a *cul-de-sac*. The first locomotives, apart from the heavy tradition of their ancestry, were, like all experimental machinery, needlessly clumsy and heavy, and their inventors, being men of insufficient faith, instead of working for lightness and smoothness of motion, took the easier course of placing them upon the tramways that were already in existence—chiefly for the transit

of heavy goods over soft roads. And from that followed a very interesting and curious result.

These tram-lines very naturally had exactly the width of an ordinary cart, a width prescribed by the strength of one horse. Few people saw in the locomotive anything but a cheap substitute for horseflesh, or found anything incongruous in letting the dimensions of a horse determine the dimensions of an engine. It mattered nothing that from the first the passenger was ridiculously cramped, hampered, and crowded in the carriage. He had always been cramped in a coach, and it would have seemed "Utopian"—a very dreadful thing indeed to our grandparents—to propose travel without cramping. By mere inertia the horse-cart gauge, the 4 ft. 8½ in. gauge, *nemine contradicente*, established itself in the world, and now everywhere the train is dwarfed to a scale that limits alike its comfort, power, and speed. Before every engine, as it were, trots the ghost of a superseded horse, refuses most resolutely to trot faster than fifty miles an hour, and shies and threatens catastrophe at every point and curve. That fifty miles an hour, most authorities are agreed, is the limit of our speed for land travel, so far as existing conditions go.¹ Only a revolutionary reconstruction of the

¹ It might be worse. If the biggest horses had been Shetland ponies, we should be travelling now in railway carriages to hold two each side at a maximum speed of perhaps twenty miles an hour. There is hardly any reason, beyond this tradition of the horse, why the railway carriage should not be even nine or ten feet wide, the width, that is, of the

railways or the development of some new competing method of land travel can carry us beyond that.

People of to-day take the railways for granted as they take sea and sky ; they were born in a railway world, and they expect to die in one. But if only they will strip from their eyes the most blinding of all influences, acquiescence in the familiar, they will see clearly enough that this vast and elaborate railway system of ours, by which the whole world is linked together, is really only a vast system of trains of horse-waggon and coaches drawn along rails by pumping-engines upon wheels. Is that, in spite of its present vast extension, likely to remain the predominant method of land locomotion—even for so short a period as the next hundred years ?

Now, so much capital is represented by the existing type of railways, and they have so firm an establishment in the acquiescence of men, that it is very doubtful if the railways will ever attempt any very fundamental change in the direction of greater speed or facility, unless they are first exposed to the pressure of our second alternative, competition, and we may very well go on to inquire how long will it be before that second alternative comes into operation—if ever it is to do so.

Let us consider what other possibilities seem to smallest room in which people can live in comfort, hung on such springs and wheels as would effectually destroy all vibration, and furnished with all the equipment of comfortable chambers.

offer themselves. Let us revert to the ideal we have already laid down, and consider what hopes and obstacles to its attainment there seem to be. The abounding presence of numerous experimental motors to-day is so stimulating to the imagination, there are so many stimulated persons at work upon them, that it is difficult to believe the obvious impossibility of most of them—their convulsiveness, clumsiness, and, in many cases, exasperating trail of stench will not be rapidly fined away.¹ I do not think that it is asking too

¹ Explosives as a motive power were first attempted by Huyghens and one or two others in the seventeenth century, and, just as with the turbine type of apparatus, it was probably the impetus given to the development of steam by the convenient collocation of coal and water and the need of an engine, that arrested the advance of this parallel inquiry until our own time. Explosive engines, in which gas and petroleum are employed, are now abundant, but for all that we can regard the explosive engine as still in its experimental stages. So far, research in explosives has been directed chiefly to the possibilities of higher and still higher explosives for use in war, the neglect of the mechanical application of this class of substance being largely due to the fact, that chemists are not as a rule engineers, nor engineers chemists. But an easily portable substance, the decomposition of which would evolve energy, or—what is, from the practical point of view, much the same thing—an easily portable substance, which could be decomposed electrically by wind or water power, and which would then recombine and supply force, either in intermittent thrusts at a piston, or as an electric current, would be infinitely more convenient for all locomotive purposes than the cumbersome bunkers and boilers required by steam. The presumption is altogether in favour of the possibility of such substances. Their advent will be the beginning of the end for steam traction on land and of the steam ship at sea: the end indeed of the Age of Coal and Steam. And even with regard to steam there may be a curious change of method before the end. It is beginning to appear that, after all, the piston and cylinder type of engine is, for locomotive purposes—on water at least, if not on land—by no means the most perfect. Another, and fundamentally different

much of the reader's faith in progress to assume that so far as a light powerful engine goes, comparatively noiseless, smooth-running, not obnoxious to sensitive nostrils, and altogether suitable for high road traffic, the problem will very speedily be solved. And upon that assumption, in what direction are these new motor vehicles likely to develop? how will they react upon the railways? and where finally will they take us?

At present they seem to promise developments upon three distinct and definite lines.

There will, first of all, be the motor truck for heavy type, the turbine type, in which the impulse of the steam spins a wheel instead of shoving a piston, would appear to be altogether better than the adapted pumping engine, at any rate, for the purposes of steam navigation. Hero, of Alexandria, describes an elementary form of such an engine, and the early experimenters of the seventeenth century tried and abandoned the rotary principle. It was not adapted to pumping, and pumping was the only application that then offered sufficient immediate encouragement to persistence. The thing marked time for quite two centuries and a half, therefore, while the piston engines perfected themselves; and only in the eighties did the requirements of the dynamo-electric machine open a "practicable" way of advance. The motors of the dynamo-electric machine in the nineteenth century, in fact, played exactly the *rôle* of the pumping engine in the eighteenth, and by 1894 so many difficulties of detail had been settled, that a syndicate of capitalists and scientific men could face the construction of an experimental ship. This ship, the *Turbinia*, after a considerable amount of trial and modification, attained the unprecedented speed of $34\frac{1}{2}$ knots an hour, and His Majesty's navy has possessed, in the *Turbinia's* younger and greater sister, the *Viper*, now unhappily lost, a torpedo-destroyer capable of 41 miles an hour. There can be little doubt that the sea speeds of 50 and even 60 miles an hour will be attained within the next few years. But I do not think that these developments will do more than delay the advent of the "explosive" or "storage of force" engine.

traffic. Already such trucks are in evidence distributing goods and parcels of various sorts. And sooner or later, no doubt, the numerous advantages of such an arrangement will lead to the organization of large carrier companies, using such motor trucks to carry goods in bulk or parcels on the high roads. Such companies will be in an exceptionally favourable position to organize storage and repair for the motors of the general public on profitable terms, and possibly to co-operate in various ways with the manufactures of special types of motor machines.

In the next place, and parallel with the motor truck, there will develop the hired or privately owned motor carriage. This, for all except the longest journeys, will add a fine sense of personal independence to all the small conveniences of first-class railway travel. It will be capable of a day's journey of three hundred miles or more, long before the developments to be presently foreshadowed arrive. One will change nothing—unless it is the driver—from stage to stage. One will be free to dine where one chooses, hurry when one chooses, travel asleep or awake, stop and pick flowers, turn over in bed of a morning and tell the carriage to wait—unless, which is highly probable, one sleeps aboard.¹ . . .

¹ The historian of the future, writing about the nineteenth century, will, I sometimes fancy, find a new meaning in a familiar phrase. It is the custom to call this the most "Democratic" age the world has ever seen, and most of us are beguiled by the etymological contrast, and the memory of certain legislative revolutions, to oppose one form

And thirdly there will be the motor omnibus, attacking or developing out of the horse omnibus companies and the suburban lines. All this seems fairly safe prophesying.

And these things, which are quite obviously coming even now, will be working out their many structural problems when the next phase in their development begins. The motor omnibus companies competing against the suburban railways will find themselves hampered in the speed of their longer runs by the slower horse traffic on their routes, and they will attempt to secure, and, it may be, after tough legislative struggles, will secure the power to form

of stupidity prevailing to another, and to fancy we mean the opposite to an "Aristocratic" period. But indeed we do not. So far as that political point goes, the Chinaman has always been infinitely more democratic than the European. But the world, by a series of gradations into error, has come to use "Democratic" as a substitute for "Wholesale," and as an opposite to "Individual," without realizing the shifted application at all. Thereby old "Aristocracy," the organization of society for the glory and preservation of the Select Dull, gets to a flavour even of freedom. When the historian of the future speaks of the past century as a Democratic century, he will have in mind, more than anything else, the unprecedented fact that we seemed to do everything in heaps—we read in epidemics; clothed ourselves, all over the world, in identical fashions; built and furnished our houses in stereo designs; and travelled—that naturally most individual proceeding—in bales. To make the railway train a perfect symbol of our times, it should be presented as uncomfortably full in the third class—a few passengers standing—and everybody reading the current number either of the *Daily Mail*, *Pearson's Weekly*, *Answers*, *Tit Bits*, or whatever Greatest Novel of the Century happened to be going. . . . But, as I hope to make clearer in my later papers, this "Democracy," or Wholesale method of living, like the railways, is transient—a first makeshift development of a great and finally (to me at least) quite hopeful social reorganization.

private roads of a new sort, upon which their vehicles will be free to travel up to the limit of their very highest possible speed. It is along the line of such private tracks and roads that the forces of change will certainly tend to travel, and along which I am absolutely convinced they will travel. This segregation of motor traffic is probably a matter that may begin even in the present decade.

Once this process of segregation from the high road of the horse and pedestrian sets in, it will probably go on rapidly. It may spread out from short omnibus routes, much as the London Metropolitan Railway system has spread. The motor carrier companies, competing in speed of delivery with the quickened railways, will conceivably co-operate with the long-distance omnibus and the hired carriage companies in the formation of trunk lines. Almost insensibly, certain highly profitable longer routes will be joined up—the London to Brighton, for example, in England. And the quiet English citizen will, no doubt, while these things are still quite exceptional and experimental in his lagging land, read one day with surprise in the violently illustrated popular magazines of 1910, that there are now so many thousand miles of these roads already established in America and Germany and elsewhere. And thereupon, after some patriotic meditations, he may pull himself together.

We may even hazard some details about these

special roads. For example, they will be very different from macadamized roads; they will be used only by soft-tired conveyances; the battering horse-shoes, the perpetual filth of horse traffic, and the clumsy wheels of laden carts will never wear them. It may be that they will have a surface like that of some cycle-racing tracks, though since they will be open to wind and weather, it is perhaps more probable they will be made of very good asphalt sloped to drain, and still more probable that they will be of some quite new substance altogether—whether hard or resilient is beyond my foretelling. They will have to be very wide—they will be just as wide as the courage of their promoters goes—and if the first made are too narrow there will be no question of gauge to limit the later ones. Their traffic in opposite directions will probably be strictly separated, and it will no doubt habitually disregard complicated and fussy regulations imposed under the initiative of the Railway Interest by such official bodies as the Board of Trade. The promoters will doubtless take a hint from suburban railway traffic and from the current difficulty of the Metropolitan police, and where their ways branch the streams of traffic will not cross at a level but by bridges. It is easily conceivable that once these tracks are in existence, cyclists and motors other than those of the constructing companies will be able to make use of them. And, moreover, once they exist it will be possible to

experiment with vehicles of a size and power quite beyond the dimensions prescribed by our ordinary roads—roads whose width has been entirely determined by the size of a cart a horse can pull.¹

Countless modifying influences will, of course, come into operation. For example, it has been assumed, perhaps rashly, that the railway influence will certainly remain jealous and hostile to these growths: that what may be called the "Bicycle Ticket Policy" will be pursued throughout. Assuredly there will be fights of a very complicated sort at first, but once one of these specialized lines is in operation, it may be that some at least of the railway companies will hasten to replace their flanged rolling stock by carriages with rubber tyres, remove their rails, broaden their cuttings and embankments, raise their bridges, and take to the new ways of traffic. Or they may find it answer to cut fares, widen their gauges, reduce their gradients, modify their points and curves, and woo the passenger back with carriages beautifully hung and sumptuously furnished, and all the convenience and luxury of a club. Few people would mind being an hour or so longer going to Paris from London, if the railway travelling was neither rickety, cramped, nor tedious. One could be patient enough if one was neither being jarred, deafened, cut into slices by draughts, and continually

¹ So we begin to see the possibility of laying that phantom horse that haunts the railways to this day so disastrously.

more densely caked in a filthy dust of coal ; if one could write smoothly and easily at a steady table, read papers, have one's hair cut, and dine in comfort¹—none of which things are possible at present, and none of which require any new inventions, any revolutionary contrivances, or indeed anything but an intelligent application of existing resources and known principles. Our rage for fast trains, so far as long-distance travel is concerned, is largely a passion to end the extreme discomfort involved. It is in the daily journey, on the suburban train, that

¹ A correspondent, Mr. Rudolf Cyrian, writes to correct me here, and I cannot do better, I think, than thank him and quote what he says. "It is hardly right to state that fifty miles an hour 'is the limit of our speed for land travel, so far as existing conditions go.' As far as English traffic is concerned, the statement is approximately correct. In the United States, however, there are several trains running now which average over considerable distances more than sixty miles an hour, stoppages included, nor is there much reason why this should not be considerably increased. What especially hampers the development of railways in England—as compared with other countries—is the fact that the rolling-stock templet is too small. Hence carriages in England have to be narrower and lower than carriages in the United States, although both run on the same standard gauge (4 feet 8½ inches). The result is that several things which you describe as not possible at present, such as to 'write smoothly and easily at a steady table, read papers, have one's hair cut, and dine in comfort,' are not only feasible, but actually attained on some of the good American trains. For instance, on the *present* Empire State Express, running between New York and Buffalo, or on the *present* Pennsylvania, Limited, running between New York and Chicago, and on others. With the Pennsylvania, Limited, travel stenographers and typewriters, whose services are placed at the disposal of passengers free of charge. But the train on which there is the least vibration of any is probably the new Empire State Express, and on this it is certainly possible to write smoothly and easily at a steady table."

daily tax of time, that speed is in itself so eminently desirable, and it is just here that the conditions of railway travel most hopelessly fail. It must always be remembered that the railway train, as against the motor, has the advantage that its wholesale traction reduces the prime cost by demanding only one engine for a great number of coaches. This will not serve the first-class long-distance passenger, but it may the third. Against that economy one must balance the necessary delay of a relatively infrequent service, which latter item becomes relatively greater and greater in proportion to the former, the briefer the journey to be made.

And it may be that many railways, which are neither capable of modification into suburban motor tracks, nor of development into luxurious through routes, will find, in spite of the loss of many elements of their old activity, that there is still a profit to be made from a certain section of the heavy goods traffic, and from cheap excursions. These are forms of work for which railways seem to be particularly adapted, and which the diversion of a great portion of their passenger traffic would enable them to conduct even more efficiently. It is difficult to imagine, for example, how any sort of road-car organization could beat the railways at the business of distributing coal and timber and similar goods, which are taken in bulk directly from the pit or wharf to local centres of distribution.

It must always be remembered that at the worst the defeat of such a great organization as the railway system does not involve its disappearance until a long period has elapsed. It means at first no more than a period of modification and differentiation. Before extinction can happen a certain amount of wealth in railway property must absolutely disappear. Though under the stress of successful competition the capital value of the railways may conceivably fall, and continue to fall, towards the marine store prices, fares and freights pursue the sweated working expenses to the vanishing point, and the land occupied sink to the level of not very eligible building sites: yet the railways will, nevertheless, continue in operation until these downward limits are positively attained

An imagination prone to the picturesque insists at this stage upon a vision of the latter days of one of the less happily situated lines. Along a weedy embankment there pants and clangs a patched and tarnished engine, its paint blistered, its parts leprously dull. It is driven by an aged and sweated driver, and the burning garbage of its furnace distils a choking reek into the air. A huge train of urban dust trucks bangs and clatters behind it, *en route* to that sequestered dumping ground where rubbish is burnt to some industrial end. But that is a lapse into the merely just possible, and at most a local tragedy. Almost certainly the existing lines of

railway will develop and differentiate, some in one direction and some in another, according to the nature of the pressure upon them. Almost all will probably be still in existence and in divers ways busy, spite of the swarming new highways I have ventured to foreshadow, a hundred years from now.

In fact, we have to contemplate, not so much a supersession of the railways as a modification and specialization of them in various directions, and the enormous development beside them of competing and supplementary methods. And step by step with these developments will come a very considerable acceleration of the ferry traffic of the narrow seas through such improvements as the introduction of turbine engines. So far as the high road and the longer journeys go this is the extent of our prophecy.¹

But in the discussion of all questions of land locomotion one must come at last to the knots of the network, to the central portions of the towns, the dense, vast towns of our time, with their high ground values and their narrow, already almost impassable, streets. I hope at a later stage to give

¹ Since this appeared in the *Fortnightly Review* I have had the pleasure of reading 'Twentieth Century Inventions,' by Mr. George Sutherland, and I find very much else of interest bearing on these questions—the happy suggestion (for the ferry transits, at any rate) of a rail along the sea bottom, which would serve as a guide to swift submarine vessels, out of reach of all that superficial "motion" that is so distressing, and of all possibilities of collision.

some reasons for anticipating that the centripetal pressure of the congested towns of our epoch may ultimately be very greatly relieved, but for the next few decades at least the usage of existing conditions will prevail, and in every town there is a certain nucleus of offices, hotels, and shops upon which the centrifugal forces I anticipate will certainly not operate. At present the streets of many larger towns, and especially of such old-established towns as London, whose central portions have the narrowest arteries, present a quite unprecedented state of congestion. When the Green of some future *History of the English People* comes to review our times, he will, from his standpoint of comfort and convenience, find the present streets of London quite or even more incredibly unpleasant than are the filthy kennels, the mudholes and darkness of the streets of the seventeenth century to our enlightened minds. He will echo our question, "Why *did* people stand it?" He will be struck first of all by the omnipresence of mud, filthy mud, churned up by hoofs and wheels under the inclement skies, and perpetually defiled and added to by innumerable horses. Imagine his description of a young lady crossing the road at the Marble Arch in London, on a wet November afternoon, "breathless, foul-footed, splashed by a passing hansom from head to foot, happy that she has reached the further pavement alive at the mere cost of her ruined clothes." . . . "Just where the bicycle might

have served its most useful purpose," he will write, "in affording a healthy daily ride to the innumerable clerks and such-like sedentary toilers of the central region, it was rendered impossible by the danger of side-slip in this vast ferocious traffic." And, indeed, to my mind at least, this last is the crowning absurdity of the present state of affairs, that the clerk and the shop hand, classes of people positively starved of exercise, should be obliged to spend yearly the price of a bicycle upon a season-ticket, because of the quite unendurable inconvenience and danger of urban cycling.

Now, in what direction will matters move? The first and most obvious thing to do, the thing that in many cases is being attempted and in a futile, insufficient way getting itself done, the thing that I do not for one moment regard as the final remedy, is the remedy of the architect and builder—profitable enough to them, anyhow—to widen the streets and to cut "new arteries." Now, every new artery means a series of new whirlpools of traffic, such as the pensive Londoner may study for himself at the intersection of Shaftesbury Avenue with Oxford Street, and unless colossal—or inconveniently steep—crossing-bridges are made, the wider the affluent arteries the more terrible the battle of the traffic. Imagine Regent's Circus on the scale of the Place de la Concorde. And there is the value of the ground to consider; with every increment of

width the value of the dwindling remainder in the meshes of the network of roads will rise, until to pave the widened streets with gold will be a mere trifling addition to the cost of their "improvement."

There is, however, quite another direction in which the congestion may find relief, and that is in the "regulation" of the traffic. This has already begun in London in an attack on the crawling cab and in the new bye-laws of the London County Council, whereby certain specified forms of heavy traffic are prohibited the use of the streets between ten and seven. These things may be the first beginning of a process of restriction that may go far. Many people living at the present time, who have grown up amidst the exceptional and possibly very transient characteristics of this time, will be disposed to regard the traffic in the streets of our great cities as a part of the natural order of things, and as unavoidable as the throng upon the pavement. But indeed the presence of all the chief constituents of this vehicular torrent—the cabs and hansoms, the vans, the omnibuses—everything, indeed, except the few private carriages—are as novel, as distinctively things of the nineteenth century, as the railway train and the needle telegraph. The streets of the great towns of antiquity, the streets of the great towns of the East, the streets of all the mediæval towns, were not intended for any sort of wheeled traffic at all—were designed

primarily and chiefly for pedestrians. So it would be, I suppose, in any one's ideal city. Surely Town, in theory at least, is a place one walks about as one walks about a house and garden, dressed with a certain ceremonious elaboration, safe from mud and the hardship and defilement of foul weather, buying, meeting, dining, studying, carousing, seeing the play. It is the growth in size of the city that has necessitated the growth of this coarser traffic that has made "Town" at last so utterly detestable.

But if one reflects, it becomes clear that, save for the vans of goods, this moving tide of wheeled masses is still essentially a stream of urban pedestrians, pedestrians who, by reason of the distances they have to go, have had to jump on 'buses and take cabs—in a word, to bring in the high road to their aid. And the vehicular traffic of the street is essentially the high road traffic very roughly adapted to the new needs. The cab is a simple development of the carriage, the omnibus of the coach, and the supplementary traffic of the underground and electric railways is a by no means brilliantly imagined adaptation of the long-route railway. These are all still new things, experimental to the highest degree, changing and bound to change much more, in the period of specialization that is now beginning.

Now, the first most probable development is a change in the omnibus and the omnibus railway. A

point quite as important with these means of transit as actual speed of movement is frequency: time is wasted abundantly and most vexatiously at present in waiting and in accommodating one's arrangements to infrequent times of call and departure. *The more frequent a local service, the more it comes to be relied upon.* Another point—and one in which the omnibus has a great advantage over the railway—is that it should be possible to get on and off at any point, or at as many points on the route as possible. But this means a high proportion of stoppages, and this is destructive to speed. There is, however, one conceivable means of transit that is not simply frequent but continuous, that may be joined or left at any point without a stoppage, that could be adapted to many existing streets at the level or quite easily sunken in tunnels, or elevated above the street level,¹ and that means of transit is the moving platform, whose possibilities have been exhibited to all the world in a sort of mean caricature at the Paris Exhibition. Let us imagine the inner circle of the district railway adapted to this conception. I will presume that the Parisian "rolling platform" is familiar to the reader. The district railway tunnel is, I imagine, about twenty-four feet wide. If we suppose the space given to six platforms of three feet wide and one (the most rapid) of six feet, and if we

¹ To the level of such upper story pavements as Sir F. Bramwell has proposed for the new Holborn to Strand Street, for example.

suppose each platform to be going four miles an hour faster than its slower fellow (a velocity the Paris experiment has shown to be perfectly comfortable and safe), we should have the upper platform running round the circle at a pace of twenty-eight miles an hour. If, further, we adopt an ingenious suggestion of Professor Perry's, and imagine the descent to the line made down a very slowly rotating staircase at the centre of a big rotating wheel-shaped platform, against a portion of whose rim the slowest platform runs in a curve, one could very easily add a speed of six or eight miles an hour more, and to that the man in a hurry would be able to add his own four miles an hour by walking in the direction of motion. If the reader is a traveller, and if he will imagine that black and sulphurous tunnel, swept and garnished, lit and sweet, with a train much faster than the existing underground trains perpetually ready to go off with him and never crowded—if he will further imagine this train a platform set with comfortable seats and neat bookstalls and so forth, he will get an inkling in just one detail of what he perhaps misses by living now instead of thirty or forty years ahead.

I have supposed the replacement to occur in the case of the London Inner Circle Railway, because there the necessary tunnel already exists to help the imagination of the English reader, but that the specific replacement will occur is rendered improbable

by the fact that the circle is for much of its circumference entangled with other lines of communication—the North-Western Railway, for example. As a matter of fact, as the American reader at least will promptly see, the much more practicable thing is that upper footpath, with these moving platforms beside it, running out over the street after the manner of the viaduct of an elevated railroad. But in some cases, at any rate, the demonstrated cheapness and practicability of tunnels at a considerable depth will come into play.

Will this diversion of the vast omnibus traffic of to-day into the air and underground, together with the segregation of van traffic to specific routes and times, be the only change in the streets of the new century? It may be a shock, perhaps, to some minds, but I must confess I do not see what is to prevent the process of elimination that is beginning now with the heavy vans spreading until it covers all horse traffic, and with the disappearance of horse hoofs and the necessary filth of horses, the road surface may be made a very different thing from what it is at present, better drained and admirably adapted for the soft-tired hackney vehicles and the torrent of cyclists. Moreover, there will be little to prevent a widening of the existing side walks, and the protection of the passengers from rain and hot sun by awnings, or such arcades as distinguish Turin, or Sir F. Bramwell's upper footpaths on the model of

the Chester rows. Moreover, there is no reason but the existing filth why the roadways should not have translucent *velaria* to pull over in bright sunshine and wet weather. It would probably need less labour to manipulate such contrivances than is required at present for the constant conflict with slush and dust. Now, of course, we tolerate the rain, because it facilitates a sort of cleaning process. . . .

Enough of this present speculation. I have indicated now the general lines of the roads and streets and ways and underways of the Twentieth Century. But at present they stand vacant in our prophecy, not only awaiting the human interests—the characters and occupations, and clothing of the throng of our children and our children's children that flows along them, but also the decorations our children's children's taste will dictate, the advertisements their eyes will tolerate, the shops in which they will buy. To all that we shall finally come, and even in the next chapter I hope it will be made more evident how conveniently these later and more intimate matters follow, instead of preceding, these present mechanical considerations. And of the beliefs and hopes, the thought and language, the further prospects of this multitude as yet unborn—of these things also we shall make at last certain hazardous guesses. But at first I would submit to those who may find the "machinery in motion" excessive in this chapter, we must have

the background and fittings—the scene before the play.¹

¹ I have said nothing in this chapter, devoted to locomotion, of the coming invention of flying. This is from no disbelief in its final practicability, nor from any disregard of the new influences it will bring to bear upon mankind. But I do not think it at all probable that aeronautics will ever come into play as a serious modification of transport and communication—the main question here under consideration. Man is not, for example, an albatross, but a land biped, with a considerable disposition towards being made sick and giddy by unusual motions, and however he soars he must come to earth to live. We must build our picture of the future from the ground upward; of flying—in its place.

This chapter has been very ably criticized in many of its details in the reviews of the first edition, but I do not think anything has been said to undermine the general proposition I have advanced nor to affect the conclusions drawn in the following chapter. I have ignored the need of guide-rails for specialized high-speed roads such as are described on p. 18, and the possibility (which my friend Mr. Joseph Conrad has suggested to me) of sliding cars along practically frictionless rails.

II

THE PROBABLE DIFFUSION OF GREAT CITIES

NOW, the velocity at which a man and his belongings may pass about the earth is in itself a very trivial matter indeed, but it involves certain other matters not at all trivial, standing, indeed, in an almost fundamental relation to human society. It will be the business of this chapter to discuss the relation between the social order and the available means of transit, and to attempt to deduce from the principles elucidated the coming phases in that extraordinary expansion, shifting and internal redistribution of population that has been so conspicuous during the last hundred years.

Let us consider the broad features of the redistribution of the population that has characterized the nineteenth century. It may be summarized as an unusual growth of great cities and a slight tendency to depopulation in the country. The growth of the great cities is the essential phenomenon. These aggregates having populations of from eight hundred thousand upward to four and five millions, are certainly, so far as the world outside the limits of

the Chinese empire goes, entirely an unprecedented thing. Never before, outside the valleys of the three great Chinese rivers, has any city—with the exception of Rome and perhaps (but very doubtfully) of Babylon—certainly had more than a million inhabitants, and it is at least permissible to doubt whether the population of Rome, in spite of its exacting a tribute of sea-borne food from the whole of the Mediterranean basin, exceeded a million for any great length of time.¹ But there are now ten town aggregates having a population of over a million, nearly twenty that bid fair to reach that limit in the next decade,

¹ It is true that many scholars estimate a high-water mark for the Roman population in excess of two millions; and one daring authority, by throwing out suburbs *ad libitum* into the Campagna, suburbs of which no trace remains, has raised the two to ten. The Colosseum could, no doubt, seat over 80,000 spectators; the circuit of the bench frontage of the Circus Maximus was very nearly a mile in length, and the Romans of Imperial times certainly used ten times as much water as the modern Romans. But, on the other hand, habits change, and Rome as it is defined by lines drawn at the times of its greatest ascendancy—the city, that is, enclosed by the walls of Aurelian and including all the regiones of Augustus, an enclosure from which there could have been no reason for excluding half or more of its population—could have scarcely contained a million. It would have packed very comfortably within the circle of the Grands Boulevards of Paris—the Paris, that is, of Louis XIV., with a population of 560,000; and the Rome of to-day, were the houses that spread so densely over the once vacant Campus Martius distributed in the now deserted spaces in the south and east, and the Vatican suburb replaced within the ancient walls, would quite fill the ancient limits, in spite of the fact that the population is under 500,000. But these are incidental doubts on a very authoritative opinion, and, whatever their value, they do not greatly affect the significance of these new great cities, which have arisen all over the world, as if by the operation of a natural law, as the railways have developed.

and a great number at or approaching a quarter of a million. We call these towns and cities, but, indeed, they are of a different order of things to the towns and cities of the eighteenth-century world.

Concurrently with the aggregation of people about this new sort of centre, there has been, it is alleged, a depletion of the country villages and small townships. But, so far as the counting of heads goes, this depletion is not nearly so marked as the growth of the great towns. Relatively, however, it is striking enough.

Now, is this growth of large towns really, as one may allege, a result of the development of railways in the world, or is it simply a change in human circumstances that happens to have arisen at the same time? It needs only a very general review of the conditions of the distribution of population to realize that the former is probably the true answer.

It will be convenient to make the issue part of a more general proposition, namely, that *the general distribution of population in a country must always be directly dependent on transport facilities*. To illustrate this point roughly we may build up an imaginary simple community by considering its needs. Over an arable country-side, for example, inhabited by a people who had attained to a level of agricultural civilization in which war was no longer constantly imminent, the population would be diffused primarily by families and groups in farmsteads. It might, if it

were a very simple population, be almost all so distributed. But even the simplest agriculturists find a certain convenience in trade. Certain definite points would be convenient for such local trade and intercourse as the people found desirable, and here it is that there would arise the germ of a town. At first it might be no more than an appointed meeting place, a market square, but an inn and a blacksmith would inevitably follow, an altar, perhaps, and, if these people had writing, even some sort of school. It would have to be where water was found, and it would have to be generally convenient of access to its attendant farmers.

Now, if this meeting place was more than a certain distance from any particular farm, it would be inconvenient for that farmer to get himself and his produce there and back, and to do his business in a comfortable daylight. He would not be able to come and, instead, he would either have to go to some other nearer centre to trade and gossip with his neighbours or, failing this, not go at all. Evidently, then, there would be a maximum distance between such places. This distance in England, where traffic has been mainly horse traffic for many centuries, seems to have worked out, according to the gradients and so forth, at from eight to fifteen miles, and at such distances do we find the country towns, while the horseless man, the serf, and the labourer and labouring wench have marked their narrow limits in the distribution of the intervening villages. If

by chance these gathering places have arisen at points much closer than this maximum, they have come into competition, and one has finally got the better of the other, so that in England the distribution is often singularly uniform. Agricultural districts have their towns at about eight miles, and where grazing takes the place of the plough, the town distances increase to fifteen.¹ And so it is, entirely as a multiple of horse and foot strides, that all the villages and towns of the world's country-side have been plotted out.²

A third, and almost final, factor determining town distribution in a world without railways, would be the seaport and the navigable river. Ports would grow into dimensions dependent on the population of the conveniently accessible coasts (or river-banks), and on the quality and quantity of their products, and near these ports, as the conveniences of civilization increased, would appear handicraft towns—the largest possible towns of a foot-and-horse civilization—with industries of such a nature as the produce of their coasts required.

¹ It will be plain that such towns must have clearly defined limits of population, *dependent finally on the minimum yearly produce of the district they control*. If ever they rise above that limit the natural checks of famine, and of pestilence following enfeeblement, will come into operation, and they will always be kept near this limit by the natural tendency of humanity to increase. The limit would rise with increasing public intelligence, and the organization of the towns would become more definite.

² I owe the fertilizing suggestion of this general principle to a paper by Grant Allen that I read long ago in *Longman's Magazine*.

It was always in connection with a port or navigable river that the greater towns of the pre-railway periods arose, a day's journey away from the coast when sea attack was probable, and shifting to the coast itself when that ceased to threaten. Such sea-trading handicraft towns as Bruges, Venice, Corinth, or London were the largest towns of the vanishing order of things. Very rarely, except in China, did they clamber above a quarter of a million inhabitants, even though to some of them there was presently added court and camp. In China, however, a gigantic river and canal system, laced across plains of extraordinary fertility, has permitted the growth of several city aggregates with populations exceeding a million, and in the case of the Hankow trinity of cities exceeding five million people.

In all these cases the position and the population limit was entirely determined by the accessibility of the town and the area it could dominate for the purposes of trade. And not only were the commercial or natural towns so determined, but the political centres were also finally chosen for strategic considerations, in a word—communications. And now, perhaps, the real significance of the previous paper, in which sea velocities of fifty miles an hour, and land travel at the rate of a hundred, and even cab and omnibus journeys of thirty or forty miles, were shown to be possible, becomes more apparent.

At the first sight it might appear as though the

result of the new developments was simply to increase the number of giant cities in the world by rendering them possible in regions where they had hitherto been impossible—concentrating the trade of vast areas in a manner that had hitherto been entirely characteristic of navigable waters. It might seem as though the state of affairs in China, in which population has been concentrated about densely-congested “million-cities,” with pauper masses, public charities, and a crowded struggle for existence, for many hundreds of years, was merely to be extended over the whole world. We have heard so much of the “problem of our great cities”; we have the impressive statistics of their growth; the belief in the inevitableness of yet denser and more multitudinous agglomerations in the future is so widely diffused, that at first sight it will be thought that no other motive than a wish to startle can dictate the proposition that not only will many of these railway-begotten “giant cities” reach their maximum in the commencing century, but that in all probability they, and not only they, but their water-born prototypes in the East also, are destined to such a process of dissection and diffusion as to amount almost to obliteration, so far, at least, as the blot on the map goes, within a measurable further space of years.

In advancing this proposition, the present writer is disagreeably aware that in this matter he has expressed views entirely opposed to those he now

propounds; and in setting forth the following body of considerations he tells the story of his own disillusionment. At the outset he took for granted—and, very naturally, he wishes to imagine that a great number of other people do also take for granted—that the future of London, for example, is largely to be got as the answer to a sort of rule-of-three sum. If in one hundred years the population of London has been multiplied by seven, then in two hundred years——! And one proceeds to pack the answer in gigantic tenement houses, looming upon colossal roofed streets, provide it with moving ways (the only available transit appliances suited to such dense multitudes), and develop its manners and morals in accordance with the laws that will always prevail amidst over-crowded humanity so long as humanity endures. The picture of this swarming concentrated humanity has some effective possibilities, but, unhappily, if, instead of that obvious rule-of-three sum, one resorts to an analysis of operating causes, its plausibility crumbles away, and it gives place to an altogether different forecast—a forecast, indeed, that is in almost violent contrast to the first anticipation. It is much more probable that these coming cities will not be, in the old sense, cities at all; they will present a new and entirely different phase of human distribution.

The determining factor in the appearance of great cities in the past, and, indeed, up to the present day,

has been the meeting of two or more transit lines, the confluence of two or more streams of trade, and easy communication. The final limit to the size and importance of the great city has been the commercial "sphere of influence" commanded by that city, the capacity of the alluvial basin of its commerce, so to speak, the volume of its river of trade. About the meeting point so determined the population so determined has grouped itself—and this is the point I overlooked in those previous vaticinations—in accordance with *laws that are also considerations of transit.*

The economic centre of the city is formed, of course, by the wharves and landing places—and in the case of railway-fed cities by the termini—where passengers land and where goods are landed, stored, and distributed. Both the administrative and business community, traders, employers, clerks, and so forth, must be within a convenient access of this centre; and the families, servants, tradesmen, amusement purveyors dependent on these again must also come within a maximum distance. At a certain stage in town growth the pressure on the more central area would become too great for habitual family life there, and an office region would differentiate from an outer region of homes. Beyond these two zones, again, those whose connection with the great city was merely intermittent would constitute a system of suburban

houses and areas. But the grouping of these, also, would be determined finally by the convenience of access to the dominant centre. That secondary centres, literary, social, political, or military, may arise about the initial trade centre, complicates the application but does not alter the principle here stated. They must all be within striking distance. The day of twenty-four hours is an inexorable human condition, and up to the present time all intercourse and business has been broken into spells of definite duration by intervening nights. Moreover, almost all effective intercourse has involved personal presence at the point where intercourse occurs. The possibility, therefore, of going and coming and doing that day's work has hitherto fixed the extreme limits to which a city could grow, and has exacted a compactness which has always been very undesirable and which is now for the first time in the world's history no longer imperative.

So far as we can judge without a close and uncongenial scrutiny of statistics, that daily journey, that has governed and still to a very considerable extent governs the growth of cities, has had, and probably always will have, a maximum limit of two hours, one hour each way from sleeping place to council chamber counter, workroom, or office stool. And taking this assumption as sound, we can state precisely the maximum area of various types of town. A pedestrian agglomeration such as we find in China, and

such as most of the European towns probably were before the nineteenth century, would be swept entirely by a radius of four miles about the business quarter and industrial centre; and, under these circumstances, where the area of the feeding regions has been very large the massing of human beings has probably reached its extreme limit.¹ Of course, in the case of a navigable river, for example, the commercial centre might be elongated into a line and the circle of the city modified into an ellipse with a long diameter considerably exceeding eight miles, as, for example, in the case of Hankow.

If, now, horseflesh is brought into the problem, an outer radius of six or eight miles from the centre will define a larger area in which the carriage folk, the hackney users, the omnibus customers, and their domestics and domestic camp followers may live and still be members of the city. Towards that limit London was already probably moving at the accession of Queen Victoria, and it was clearly the absolute limit of urban growth—until locomotive mechanisms capable of more than eight miles an hour could be constructed.

And then there came suddenly the railway and the steamship, the former opening with extraordinary abruptness a series of vast through-routes for trade,

¹ It is worth remarking that in 1801 the density of population in the City of London was half as dense again as that of any district, even of the densest "slum" districts, to-day.

the latter enormously increasing the security and economy of the traffic on the old water routes. For a time neither of these inventions was applied to the needs of intra-urban transit at all. For a time they were purely centripetal forces. They worked simply to increase the general volume of trade, to increase, that is, the pressure of population upon the urban centres. As a consequence the social history of the middle and later thirds of the nineteenth century, not simply in England but all over the civilized world, is the history of a gigantic rush of population into the magic radius of—for most people—four miles, to suffer there physical and moral disaster less acute but, finally, far more appalling to the imagination than any famine or pestilence that ever swept the world. Well has Mr. George Gissing named nineteenth-century London in one of his great novels the "Whirlpool," the very figure for the nineteenth-century Great City, attractive, tumultuous, and spinning down to death.

But, indeed, these great cities are no permanent maelstroms. These new forces, at present still so potently centripetal in their influence, bring with them, nevertheless, the distinct promise of a centrifugal application that may be finally equal to the complete reduction of all our present congestions. The limit of the pre-railway city was the limit of man and horse. But already that limit has been exceeded, and each day brings us nearer to the time

when it will be thrust outward in every direction with an effect of enormous relief.

So far the only additions to the foot and horse of the old dispensation that have actually come into operation, are the suburban railways, which render possible an average door to office hour's journey of ten or a dozen miles—further only in the case of some specially favoured localities. The star-shaped contour of the modern great city, thrusting out arms along every available railway line, knotted arms of which every knot marks a station, testify sufficiently to the relief of pressure thus afforded. Great Towns before this century presented rounded contours and grew as a puff-ball swells; the modern Great City looks like something that has burst an intolerable envelope and splashed. But, as our previous paper has sought to make clear, these suburban railways are the mere first rough expedient of far more convenient and rapid developments.

We are—as the Census Returns for 1901 quite clearly show—in the early phase of a great development of centrifugal possibilities. And since it has been shown that a city of pedestrians is inexorably limited by a radius of about four miles, and that a horse-using city may grow out to seven or eight, it follows that the available area of a city which can offer a cheap suburban journey of thirty miles an hour is a circle with a radius of thirty miles. And is it too much, therefore, in view of all that has been

adduced in this and the previous paper, to expect that the available area for even the common daily toilers of the great city of the year 2000, or earlier, will have a radius very much larger even than that? Now, a circle with a radius of thirty miles gives an area of over 2800 square miles, which is almost a quarter that of Belgium. But thirty miles is only a very moderate estimate of speed, and the reader of the former paper will agree, I think, that the available area for the social equivalent of the favoured season-ticket holders of to-day will have a radius of over one hundred miles, and be almost equal to the area of Ireland.¹ The radius that will sweep the area available for such as now live in the outer suburbs will include a still vaster area. Indeed, it is not too much to say that the London citizen of the year 2000 A.D. may have a choice of nearly all England and Wales south of Nottingham and east of Exeter as his suburb, and that the vast stretch of country from Washington to Albany will be all of it "available" to the active citizen of New York and Philadelphia before that date.

This does not for a moment imply that cities of the density of our existing great cities will spread to these limits. Even if we were to suppose the increase of the populations of the great cities to go on at its present rate, this enormous extension of available

¹ Be it noted that the phrase "available area" is used, and various other modifying considerations altogether waived for the present.

area would still mean a great possibility of diffusion. But though most great cities are probably still very far from their maxima, though the network of feeding railways has still to spread over Africa and China, and though huge areas are still imperfectly productive for want of a cultivating population, yet it is well to remember that for each great city, quite irrespective of its available spaces, a maximum of population is fixed. Each great city is sustained finally by the trade and production of a certain proportion of the world's surface—by the area it commands commercially. The great city cannot grow, except as a result of some quite morbid and transitory process—to be cured at last by famine and disorder—beyond the limit the commercial capacity of that commanded area prescribes. Long before the population of this city, with its inner circle a third of the area of Belgium, rose towards the old-fashioned city density, this restriction would come in. Even if we allowed for considerable increase in the production of food stuffs in the future, it still remains inevitable that the increase of each city in the world must come at last upon arrest.

Yet, though one may find reasons for anticipating that this city will in the end overtake and surpass that one and such-like relative prophesying, it is difficult to find any data from which to infer the absolute numerical limits of these various diffused cities. Or perhaps it is more seemly to admit that

no such data have occurred to the writer. So far as London, St. Petersburg, and Berlin go, it seems fairly safe to assume that they will go well over twenty millions; and that New York, Philadelphia, and Chicago will probably, and Hankow almost certainly, reach forty millions. Yet even forty millions over thirty-one thousand square miles of territory is, in comparison with four millions over fifty square miles, a highly diffused population.

How far will that possible diffusion accomplish itself? Let us first of all consider the case of those classes that will be free to exercise a choice in the matter, and we shall then be in a better position to consider those more numerous classes whose general circumstances are practically dictated to them. What will be the forces acting upon the prosperous household, the household with a working head and four hundred a year and upwards to live upon, in the days to come? Will the resultant of these forces be, as a rule, centripetal or centrifugal? Will such householders in the greater London of 2000 A.D. still cluster for the most part, as they do to-day, in a group of suburbs as close to London as is compatible with a certain fashionable maximum of garden space and air; or will they leave the ripened gardens and the no longer brilliant villas of Surbiton and Norwood, Tooting and Beckenham, to other and less independent people? First, let us weigh the centrifugal attractions.

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The first of these is what is known as the passion for nature, that passion for hillside, wind, and sea that is evident in so many people nowadays, either frankly expressed or disguising itself as a passion for golfing, fishing, hunting, yachting, or cycling; and, secondly, there is the allied charm of cultivation, and especially of gardening, a charm that is partly also the love of dominion, perhaps, and partly a personal love for the beauty of trees and flowers and natural things. Through that we come to a third factor, that craving—strongest, perhaps, in those Low German peoples, who are now ascendant throughout the world—for a little private *imperium* such as a house or cottage “in its own grounds” affords; and from that we pass on to the intense desire so many women feel—and just the women, too, who will mother the future—their almost instinctive demand, indeed, for a household, a separate sacred and distinctive household, built and ordered after their own hearts, such as in its fulness only the country-side permits. Add to these things the healthfulness of the country for young children, and the wholesome isolation that is possible from much that irritates, stimulates prematurely, and corrupts in crowded centres, and the chief positive centrifugal inducements are stated, inducements that no progress of inventions, at any rate, can ever seriously weaken. What now are the centripetal forces against which these inducements contend?

In the first place, there are a group of forces that will diminish in strength. There is at present the greater convenience of "shopping" within a short radius of the centre of the great city, a very important consideration indeed to many wives and mothers. All the inner and many of the outer suburbs of London obtain an enormous proportion of the ordinary household goods from half a dozen huge furniture, grocery, and drapery firms, each of which has been enabled by the dearness and inefficiency of the parcels distribution of the post-office and railways to elaborate a now very efficient private system of taking orders and delivering goods. Collectively these great businesses have been able to establish a sort of monopoly of suburban trade, to overwhelm the small suburban general tradesman (a fate that was inevitable for him in some way or other), and—which is a positive world-wide misfortune—to overwhelm also many highly specialized shops and dealers of the central district. Suburban people nowadays get their wine and their novels, their clothes and their amusements, their furniture and their food, from some one vast indiscriminate shop or "store" full of respectable mediocre goods, as excellent a thing for house-keeping as it is disastrous to taste and individuality.¹

¹ Their temporary suppression of the specialist is indeed carried to such an extent that one may see even such things as bronze ornaments and personal jewellery listed in Messrs. Omnium's list, and stored in list designs and pattern; and their assistants will inform you that their brooch, No. 175, is now "very much worn," without either blush or smile.

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But it is doubtful if the delivery organization of these great stores is any more permanent than the token coinage of the tradespeople of the last century. Just as it was with that interesting development, so now it is with parcels distribution: private enterprise supplies in a partial manner a public need, and with the organization of a public parcels and goods delivery on cheap and sane lines in the place of our present complex, stupid, confusing, untrustworthy, and fantastically costly chaos of post-office, railways, and carriers, it is quite conceivable that Messrs. Omnium will give place again to specialized shops.

It must always be remembered how timid, tentative, and dear the postal and telephone services of even the most civilized countries still are, and how inexorably the needs of revenue, public profit, and convenience fight in these departments against the tradition of official leisure and dignity. There is no reason now, except that the thing is not yet properly organized, why a telephone call from any point in such a small country as England to any other should cost much more than a postcard. There is no reason now, save railway rivalries and retail ideas—obstacles some able and active man is certain to sweep away sooner or later—why the post-office should not deliver parcels anywhere within a radius of a hundred miles in a few hours at a penny or less for a pound and a little over,¹

¹ The present system of charging parcels by the pound, when goods are sold by the pound, and so getting a miserly profit in the packing,

put our newspapers in our letter-boxes direct from the printing-office, and, in fact, hand in nearly every constant need of the civilized household, except possibly butcher's meat, coals, green-grocery, and drink. And since there is no reason, but quite removable obstacles, to prevent this development of the post-office, I imagine it will be doing all these things within the next half-century. When it is, this particular centripetal pull, at any rate, will have altogether ceased to operate.

A second important centripetal consideration at present is the desirability of access to good schools and to the doctor. To leave the great centres is either to abandon one's children, or to buy air for them at the cost of educational disadvantages. But access, be it noted, is another word for transit. It is doubtful if these two needs will so much keep people close to the great city centres as draw them together about secondary centres. New centres they may be—compare Hindhead, for example—in many cases; but also, it may be, in many cases the more healthy and picturesque of the existing small towns will develop a new life. Already, in the case of the London area, such once practically autonomous places as Guildford, Tunbridge Wells, and Godalming have become economically the centres of lax suburbs, and the same fate may very probably overtake, for is surely one of the absurdest disregards of the obvious it is possible to imagine.

example, Shrewsbury, Stratford, and Exeter, and remoter and yet remoter townships. Indeed, for all that this particular centripetal force can do, the confluent "residential suburbs" of London, of the great Lancashire-Yorkshire city, and of the Scotch city, may quite conceivably replace the summer lodging-house watering-places of to-day, and extend themselves right round the coast of Great Britain, before the end of the next century, and every open space of mountain and heather be dotted—not too thickly—with clumps of prosperous houses about school, doctor, engineers, book and provision shops.

A third centripetal force will not be set aside so easily. The direct antagonist it is to that love of nature that drives people out to moor and mountain. One may call it the love of the crowd; and closely allied to it is that love of the theatre which holds so many people in bondage to the Strand. Charles Lamb was the Richard Jefferies of this group of tendencies, and the current disposition to exaggerate the opposition force, especially among English-speaking peoples, should not bind us to the reality of their strength. Moreover, interweaving with these influences that draw people together are other more egotistical and intenser motives, ardent in youth and by no means—to judge by the Folkestone Leas—extinct in age, the love of dress, the love of the crush, the hot passion for the promenade. Here, no doubt, what one may speak of loosely as "racial"

characteristics count for much. The common actor and actress of all nationalities, the Neapolitan, the modern Roman, the Parisian, the Hindoo, I am told, and that new and interesting type, the rich and liberated Jew emerging from his Ghetto and free now absolutely to show what stuff he is made of, flame out most gloriously in this direction. To a certain extent this group of tendencies may lead to the formation of new secondary centres within the "available" area, theatrical and musical centres—centres of extreme Fashion and Selectness, centres of smartness and opulent display—but it is probable that for the large number of people throughout the world who cannot afford to maintain households in duplicate these will be for many years yet strictly centripetal forces, and will keep them within the radius marked by whatever will be the future equivalent in length of, say, the present two-shilling cab ride in London.

And, after all, for all such "shopping" as one cannot do by telephone or postcard, it will still be natural for the shops to be gathered together in some central place. And "shopping" needs refreshment, and may culminate in relaxation. So that Bond Street and Regent Street, the Boulevard des Capuchins, the Corso, and Broadway will still be brilliant and crowded for many years for all the diffusion that is here forecast—all the more brilliant and crowded, perhaps, for the lack of a thronging horse traffic down their central ways. But the very fact that the old

nucleus is still to be the best place for all who trade in a concourse of people, for novelty shops and art shops, and theatres and business buildings, by keeping up the central ground values will operate against residence there and shift the "masses" outwardly.

And once people have been driven into cab, train, or omnibus, the only reason why they should get out to a residence here rather than there is the necessity of saving time, and such a violent upward gradient of fares as will quite outbalance the downward gradient of ground values. We have, however, already forecast a swift, varied, and inevitably competitive suburban traffic. And so, though the centre will probably still remain the centre and "Town," it will be essentially a bazaar, a great gallery of shops and places of concourse and rendezvous, a pedestrian place, its pathways reinforced by lifts and moving platforms, and shielded from the weather, and altogether a very spacious, brilliant, and entertaining agglomeration.

Enough now has been said to determine the general nature of the expansion of the great cities in the future, so far as the more prosperous classes are concerned. It will not be a regular diffusion like the diffusion of a gas, but a process of throwing out the "homes," and of segregating various types of people. The omens seem to point pretty unmistakably to a wide and quite unprecedented diversity in the various suburban townships and suburban districts. Of that

aspect of the matter a later paper must treat. It is evident that from the outset racial and national characteristics will tell in this diffusion. We are getting near the end of the great Democratic, Wholesale, or Homogeneous phase in the world's history. The sport-loving Englishman, the sociable Frenchman, the vehement American will each diffuse his own great city in his own way.

And now, how will the increase in the facilities of communication we have assumed affect the condition of those whose circumstances are more largely dictated by economic forces? The mere diffusion of a large proportion of the prosperous and relatively free, and the multiplication of various types of road and mechanical traction, means, of course, that in this way alone a perceptible diffusion of the less independent classes will occur. To the subsidiary centres will be drawn doctor and schoolmaster, and various dealers in fresh provisions, baker, grocer, butcher; or if they are already established there they will flourish more and more, and about them the convenient home of the future, with its numerous electrical and mechanical appliances, and the various bicycles, motor-cars, photographic and phonographic apparatus that will be included in its equipment will gather a population of repairers, "accessory" dealers and working engineers, a growing class which from its necessary intelligence and numbers will play a very conspicuous part in the social development

of the twentieth century. The much more elaborate post-office and telephone services will also bring intelligent ingredients to these suburban nuclei, these restorations of the old villages and country towns. And the sons of the cottager within the affected area will develop into the skilled vegetable or flower gardeners, the skilled ostler—with some veterinary science—and so forth, for whom also there will evidently be work and a living. And dotted at every convenient position along the new roads, availing themselves no doubt whenever possible of the picturesque inns that the old coaching days have left us, will be wayside restaurants and tea houses, and motor and cycle stores and repair places. So much diffusion is practically inevitable.

In addition, as we have already intimated, many Londoners in the future may abandon the city office altogether, preferring to do their business in more agreeable surroundings. Such a business as book publishing, for example, has no unbreakable bonds to keep it in the region of high rent and congested streets. The days when the financial fortunes of books depended upon the colloquial support of influential people in a small Society are past; neither publishers nor authors as a class have any relation to Society at all, and actual access to newspaper offices is necessary only to the ranker forms of literary imposture. That personal intercourse between publishers and the miscellaneous race of

authors which once justified the central position has, I am told, long since ceased. And the withdrawing publishers may very well take with them the printers and binders, and attract about them their illustrators and designers. . . . So, as a typical instance, one—now urban—trade may detach itself.

Publishing is, however, only one of the many similar trades equally profitable and equally likely to move outward to secondary centres, with the development and cheapening of transit. It is all a question of transit. Limitation of transit contracts the city, facilitation expands and disperses it. All this case for diffusion so far is built up entirely on the hypothesis we attempted to establish in the first paper, that transit of persons and goods alike is to become easier, swifter, and altogether better organized than it is at present.

The telephone will almost certainly prove a very potent auxiliary indeed to the forces making for diffusion. At present that convenience is still needlessly expensive in Great Britain, and a scandalously stupid business conflict between telephone company and post-office delays, complicates, and makes costly and exasperating all trunk communications; but even under these disadvantages the thing is becoming a factor in the life of ordinary villadom. Consider all that lies within its possibilities. Take first the domestic and social side; almost all the labour of ordinary shopping can be avoided—goods